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Example 1

The distance $f(P)$ of any point from a fixed point P_0

$$f(P) = f(x,y,z) = \sqrt{(x-x_0)^2+(y-y_0)^2+(z-z_0)^2}$$

Example 3

This vector function describes the gravitational force acting on B

$$P = |P|\left(-\frac{1}{r}\hat{r}\right) = -\frac{C}{r^3}\hat{r} = \left[-C\frac{x-x_0}{r^3}, -C\frac{y-y_0}{r^3}, -C\frac{z-z_0}{r^3}\right]$$

$$= -C\frac{x-x_0}{r^3}\hat{i} - C\frac{y-y_0}{r^3}\hat{j} - C\frac{z-z_0}{r^3}\hat{k}$$

Definition of Continuity

A vector function $V(t)$ is said to be continuous at $t=t_0$ if it is defined in some neighborhood of t_0 (including at t_0 itself!) and

$$\lim_{t\to t_0} V(t) = V(t_0)$$

Cartesian Coordinates

$$V(t) = [V_1(t), V_2(t), V_3(t)] = V_1(t)\hat{i} + V_2(t)\hat{j} + V_3(t)\hat{k}$$

Differential $V(t)$

$$V'(t) = [V_1'(t), V_2'(t), V_3'(t)]$$

Product Rules for $(u\cdot v)'$ & $(u\times v)'$

$$(u\cdot v)' = u'\cdot v + u\cdot v'$$
$$(u\times v)' = u'\times v + u\times v'$$